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ANNUAL FISH PASSAGE REPORT
ROCK ISLAND DAM
COLUMBIA RIVER, WASHINGTON, 1959

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SPECIAL SCIENTIFIC REPORT–FISHERIES No. 394

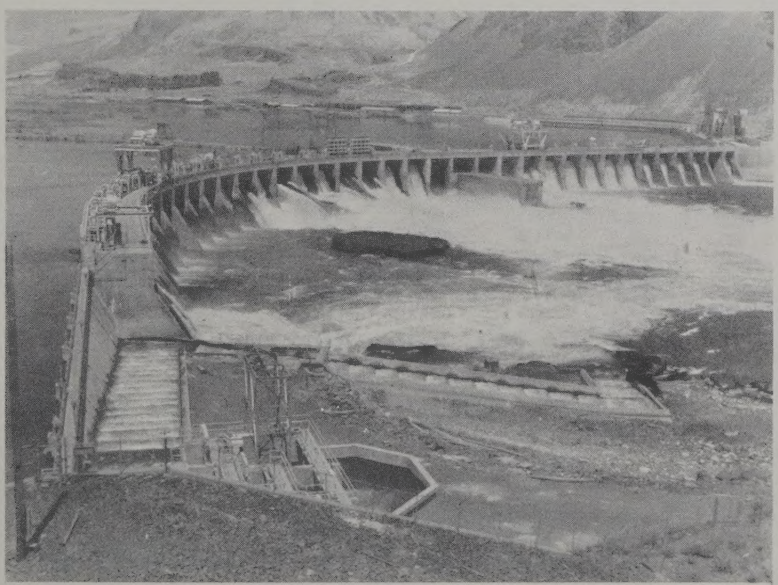
UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

United States Department of the Interior, Stewart L. Udall, Secretary
Fish and Wildlife Service, Clarence F. Pautzke, Commissioner
Bureau of Commercial Fisheries, Donald L. McKernan, Director

ANNUAL FISH PASSAGE REPORT - ROCK ISLAND DAM COLUMBIA RIVER, WASHINGTON, 1959

by

Paul D. Zimmer, Clifton C. Davidson, and Floyd S. Anders



United States Fish and Wildlife Service
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Paul D. Zimmer, Clifton C. Davidson
and Floyd S. Anders
Fishery Biologists (Management)

ABSTRACT

Important runs of salmon and steelhead pass Rock Island Dam on the Columbia River. Annual records of fish movement past the dam are available from 1933.

Count of 23,352 chinook salmon in 1959 was less than half the peak year of 1957. Sockeye count of 72,351 exceeded the 26-year mean of 52,073. Only 118 coho salmon were recorded. Greatest count of coho, 229, occurred in 1947. Numbers of steelhead passing Rock Island Dam increased in 1959. The 26-year mean of 2,900 steelhead was less than 1959 count of 4,138.

INTRODUCTION

Rock Island Dam, located on the Columbia River approximately 12 miles downstream from the city of Wenatchee, Wash., has been in operation since 1933. The plant is owned and operated by Chelan County Public Utility District.

This report on passage of fish at Rock Island Dam during 1959 provides information on operation of fishways and numbers of salmon and steelhead utilizing upstream fish passage facilities. Fish other than salmon and steelhead were not enumerated during the period of "spot counting", hence data pertaining to their numbers are not included in this report.

Rock Island Dam is now equipped with three fishways: one located on the right bank, another on the left bank, and the third approximately in the center of the dam. Two of the fish ladders were placed in operation in 1933, and the third (middle ladder) was constructed in 1935-36. All three ladders have undergone significant modifications since initial construction.

Included in this report are comments covering various investigations carried on at Rock Island during 1959.

Note.--Paul D. Zimmer and Clifton C. Davidson (deceased), Bureau of Commercial Fisheries Columbia River Portland Program Office, U.S. Fish and Wildlife Service, Portland, Oregon; and Floyd S. Anders, Bureau of Commercial Fisheries Branch of Resource Management, U.S. Fish and Wildlife Service, Washington, D. C.

COUNTING PROCEDURES

Fish counting at Rock Island Dam in 1959 began on May 4 and terminated on September 30. From May 4 through July 15 counting was conducted on a "sample count" basis.[1] From July 16 to September 19 counting was on a full-time basis (16 hours per day). During the sample or "spot count" period gates at the fish counting weirs remained open at all times to permit unrestricted passage of upstream migrating fish.

In developing a sample count system a study was made of past counting records at Rock Island Dam. During 1954-55 conditions were fairly stable at the dam and fish count data for these 2 years were used in developing the sample count system. During this period there were no experiments being conducted to materially affect movement of fish.

From study of past count records the following procedure for sample counting was developed:

1. Period May 4-July 15 was divided into 18 4-day periods with 1 day left over.

2. Counting gates were open from 4:00 a.m. to 8:00 p.m.

3. Within each day of the 4-day periods there were 16 counting periods of 45 minutes each, beginning on the hour and ending 45 minutes past the hour. This allowed 15 minutes for the counter to move to the next ladder.

4. On each day of 4-day periods fish were enumerated 8 counting periods at left ladder and 4 counting periods at right and center ladders.

5. Each day the counter started at a different ladder, alternating between the three.

6. Four-day counting schedule (table 1).

7. Estimated number of fish passing over left ladder on any 16-hour day or 4-day cycle was computed as follows:

   a. Number counting periods - 8

   b. Duration of each counting period - 45 minutes (.75 of an hour)

   c. Total hours of counting - 8 x .75 = 6 hours

   d. Number of fish counted during 8-hour period - N

   e. Average number of fish per hour - N ÷ 6

   f. Number hours fishway open - 16

   g. Total estimated number of fish - 16 x e.

   Estimated numbers of fish passing right and center ladders were based on four counting periods of 3 hours each.

ENUMERATION OF FISH

Chinook Salmon *Oncorhynchus tshawytscha*

The chinook salmon count in 1959 of 23,352 is well above the mean of 14,838 for the 26-year period 1933-1958. However, the count declined from that of 1958 and was a little less than

[1] System of sample counting was developed by Biometrics Section, Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, Seattle, Wash.

TABLE 1.--Four-day counting schedule at Rock Island Dam, 1959

[X - indicates time of counting]

Ladders	Time A.M.								Time P.M.							
	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
First day																
Left	X		X		X		X		X		X		X		X	
Center		X				X				X				X		
Right				X				X				X				X
Second day																
Left		X		X		X		X		X		X		X		X
Center	X				X				X				X			
Right			X				X				X				X	
Third day																
Left	X		X		X		X		X		X		X		X	
Center				X				X				X				X
Right		X				X				X				X		
Fourth day																
Left		X		X		X		X		X		X		X		X
Center			X				X				X				X	
Right	X				X				X				X			

half the peak annual count of 50,713 in 1957 (table 2). Maximum day's count in 1959 was 1,528 fish on May 25 (table 3).

Tables 4 and 5 show semimonthly totals of number and percentage of chinook count which ascended each fish ladder.

Chinook Salmon Jacks

Some chinook salmon return from the ocean during the year following their seaward migration and are referred to as "jacks". These fish are predominantly males, and are smaller than the average. It has been determined at Rock Island Dam that up to June 30 of each year jacks rarely, if ever, exceed 18 inches in length while the balance of the fish appreciably exceed that length. Likewise from July 1 to the end of the season jacks rarely, if ever, exceed 22 inches in length. Consequently, jacks at Rock Island are identified by considering all chinooks 18 inches or less in length prior to July 1 as jacks, and all chinooks 22 inches or less in length subsequent to June 30 as jacks. Maximum day's count in 1959 of chinook jacks occurred on May 25 (table 3). The 5,960 fish recorded as jacks constitute 25.5 percent of the total 1959 chinook run.

Sockeye Salmon, *Oncorhynchus nerka* (blueback or red)

The sockeye count of 72,351 for 1959 was greater than the 26-year mean of 52,073 (table 2). In 1959, peak of the run was reached on July 28, when 4,081 fish were counted past the ladders at Rock Island Dam.

In recent years attention has been drawn to the many small blueback both at Bonneville and Rock Island Dams. During the 1959 counting period at Rock Island Dam sockeye under 16 inches in

TABLE 2.--Annual counts of salmon and steelhead at Rock Island Dam, 1933-1959

Year	Chinook salmon	Steelhead	Sockeye	Coho salmon	Total
1933	5,668	[1] 1,055	40,737	182	47,642
1934	[1] 6,482	583	2,227	69	9,361
1935	16,310	5,412	14,013	10	35,745
1936	[1] 7,396	[1] 2,369	16,501	0	26,266
1937	5,133	[1] 2,214	15,087	58	22,492
1938	5,803	2,400	17,123	78	25,404
1939	11,206	[1] 5,427	19,591	13	36,237
1940	9,492	5,550	26,894	2	41,938
1941	2,571	3,561	949	29	7,110
1942	6,814	3,586	16,282	1	26,683
1943	11,145	2,249	17,665	22	31,081
1944	3,375	1,329	4,932	186	9,822
1945	5,696	1,121	7,142	166	14,125
1946	9,992	1,761	45,029	32	56,814
1947	11,766	2,115	79,834	229	93,944
1948	7,083	2,360	84,184	29	93,656
1949	12,353	2,470	18,600	40	33,463
1950	10,348	1,852	50,134	72	62,406
1951	18,752	3,121	101,826	8	123,707
1952	20,121	2,883	114,349	27	137,380
1953	31,080	4,001	151,747	40	186,868
1954	33,283	5,407	91,234	44	129,968
1955	25,658	3,141	155,055	39	183,893
1956	25,085	1,540	92,443	29	119,097
1957	50,713	3,927	71,621	27	126,288
1958	32,457	3,970	98,695	60	135,182
1959[2]	23,352	4,138	72,351	118	99,959

[1] Incomplete count.

[2] Counts for the period from May 4 through July 15, 1959, were computed by extrapolating sample counts.

length were enumerated as small fish. Number of sockeye recorded as "small" was 8,383 (11.6 percent).

Tables 6 and 7 show semimonthly totals of number and percentage of sockeye count ascending each ladder.

Of the sockeye passing Rock Island Dam 55.5 percent ascended the left ladder, while 23.0 and 21.5 percent ascended the middle and right ladders, respectively. Data pertaining to sockeye daily counts are contained in tables 9-12.

TABLE 3.--Maximum daily counts, salmon and steelhead Rock Island Dam, 1959

Species	Date	Number of fish
Chinook	May 25	1,341
Chinook (jacks)	May 25	187
Steelhead	Aug. 26	141
Sockeye (large)	July 28	3,612
Sockeye (small)	July 28	469
Coho	Sept. 23, 24, and 28	11

Coho Salmon, *Oncorhynchus kisutch* (silver)

The coho salmon count of 118 in 1959 was a little better than twice the 26-year mean of 57, and is the fifth highest count recorded at Rock Island Dam for this species (table 2). It is the largest count since 1947 when the peak annual count of 229 was attained. Additional data are shown in tables 3 and 13.

TABLE 4.--Number and percent of chinook salmon counted over each fish ladder, Rock Island Dam, 1959 (Jacks not included)

Date	Left ladder		Center ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	
May 1-15	-	-	-	-	-	-	-
May 16-31	927	22.2	1,753	42.1	1,488	35.7	4,168
June 1-15	358	28.5	628	49.9	271	21.6	1,257
June 16-30	227	40.4	187	33.3	148	26.3	562
July 1-15	488	38.2	373	29.2	416	32.6	1,277
July 16-31	1,347	74.2	230	12.7	237	13.1	1,814
Aug. 1-15	4,274	84.5	70	1.4	712	14.1	5,056
Aug. 16-31	1,916	89.7	15	.7	206	9.6	2,137
Sept. 1-15	512	86.8	15	2.5	63	10.7	590
Sept. 16-30	463	87.2	11	2.1	57	10.7	531
Total	10,512	60.4	3,282	18.9	3,598	20.7	17,392

TABLE 5.--Number and percent of chinook salmon, jacks counted, over each fish ladder, Rock Island Dam, 1959

Date	Left ladder		Center ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	
May 1-15	-	-	-	-	-	-	-
May 16-31	219	33.4	223	34.0	214	32.6	656
June 1-15	240	31.7	326	43.1	191	25.2	757
June 16-30	211	52.7	84	21.0	105	26.3	400
July 1-15	219	36.0	186	30.6	203	33.4	608
July 16-31	417	51.7	252	31.2	138	17.1	807
Aug. 1-15	703	75.7	50	5.4	176	18.9	929
Aug. 16-31	580	89.6	3	.5	64	9.9	647
Sept. 1-15	658	88.2	6	.8	82	11.0	746
Sept. 16-30	298	72.7	47	11.5	65	15.8	410
Total	3,545	59.5	1,177	19.7	1,238	20.8	5,960

TABLE 6.--Number and percent of sockeye salmon (large) counted over each fish ladder, Rock Island Dam, 1959

Date	Left ladder		Center ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	
May 1-15	-	-	-	-	-	-	-
May 16-31	-	-	-	-	-	-	-
June 1-15	-	-	-	-	-	-	-
June 16-30	5	100.0	-	-	-	-	5
July 1-15	1,216	45.5	775	29.0	683	25.5	2,674
July 16-31	15,362	50.0	9,521	31.0	5,834	19.0	30,717
Aug. 1-15	11,193	56.1	3,691	18.5	5,074	25.4	19,958
Aug. 16-31	5,356	67.4	818	10.3	1,772	22.3	7,946
Sept. 1-15	1,403	65.1	180	8.4	571	26.5	2,154
Sept. 16-30	396	77.0	24	4.7	94	18.3	514
Total	34,931	54.6	15,009	23.5	14,028	21.9	63,968

TABLE 7.--Number and percent of sockeye salmon (small) counted over each fish ladder, Rock Island Dam, 1959

Date	Left ladder		Center ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	
May 1-15	-	-	-	-	-	-	-
May 16-31	-	-	-	-	-	-	-
June 1-15	-	-	-	-	-	-	-
June 16-30	-	-	-	-	-	-	-
July 1-15	317	52.5	154	25.5	133	22.0	604
July 16-31	2,515	60.4	961	23.1	687	16.5	4,163
Aug. 1-15	1,379	63.3	353	16.2	448	20.5	2,180
Aug. 16-31	704	71.1	105	10.6	181	18.3	990
Sept. 1-15	232	63.7	74	20.3	58	16.0	364
Sept. 16-30	63	76.8	2	2.5	17	20.7	82
Total	5,210	62.1	1,649	19.7	1,524	18.2	8,383

Steelhead Trout, *Salmo gairdneri gairdneri*

The steelhead count of 4,138 in 1959 was higher than those of the preceding 4 years, and is well above the 26-year mean of 2,900 (table 2).

Additional data pertaining to steelhead daily counts are contained in tables 8-12.

Maximum day's count in 1959 was 141 on August 26 (table 3).

Table 14 shows semimonthly totals of number and percentage of steelhead which ascended each fish ladder.

TABLE 8.--Daily temperature, stream flow and fish count data, Rock Island Dam, May 1959

Date	Air temperatures		Water temperatures[1]	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
May 1	-	-	-	-					
2	-	-	-	-					
3	-	-	-	-					
4	-	-	-	-					
5	-	-	-	-					
6	-	-	-	-					
7	-	-	-	-					
8	-	-	-	-					
9	-	-	-	-					
10	-	-	48.0	219,600				14	14
11	69	41	48.0	222,600				13	13
12	76	42	49.0	233,100				3	3
13	-	-	49.5	221,100				11	11
14	-	-	49.5	218,100				5	5
15	60	49	49.5	218,100				0	0
16	69	45	49.5	225,500				11	11
17	65	52	49.5	227,000				5	5
18	62	42	49.0	225,500	85			10	95
19	63	52	49.0	230,000	99			16	115
20	68	48	49.5	230,000	133			8	141
21	-	-	49.5	225,500	445			27	472
22	-	-	50.5	237,800	325			19	344
23	-	-	50.5	242,600	243			30	273
24	-	-	50.0	260,900	296			27	323
25	82	39	49.0	274,800	1,528			32	1,560
26	65	48	49.0	280,200	576			5	581
27	65	46	49.5	293,500	487			10	497
28	68	58	49.5	289,600	301			0	301
29	-	-	50.5	306,400	155			0	155
30	74	50	50.5	306,400	90			15	105
31	78	48	51.5	326,900	61			10	71

[1] Surface temperatures taken with pocket thermometer are given in degrees Fahrenheit.

TABLE 9.--Daily temperature, stream flow and fish count data, Rock Island Dam, June 1959

Date	Air temperatures		Water temperatures[1]	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
June 1	85	52	51.5	328,500	65			0	65
2	84	60	51.0	335,100	266			0	266
3	77	51	51.0	330,200	275			0	275
4	72	48	51.0	320,300	189			0	189
5	73	58	51.0	328,500	132			0	132
6	70	52	51.0	333,500	73			0	73
7	70	52	51.5	333,500	139			0	139
8	69	50	51.0	343,600	109			0	109
9	69	46	51.0	355,600	168			0	168
10	-	-	51.5	345,300	83			0	83
11	-	-	51.5	352,100	150			0	150
12	-	-	52.5	357,300	133			0	133
13	-	-	51.5	371,200	96			0	96
14	80	39	52.0	367,700	65			0	65
15	75	44	52.0	362,500	71			0	71
16	74	52	52.0	373,000	125			0	125
17	74	55	52.5	374,800	48			0	48
18	84	56	52.0	373,000	53			0	53
19	94	64	53.0	387,500	66			0	66
20	-	-	54.0	383,900	99			0	99
21	-	-	54.5	396,800	81			0	81
22	91	65	54.0	409,900	39			0	39
23	79	65	54.0	413,600	95			0	95
24	78	62	54.0	415,500	34			0	34
25	-	-	54.0	413,600	53			0	53
26	-	-	54.0	421,100	32			0	32
27	-	-	54.5	432,700	26			0	26
28	-	-	55.0	434,700	29			0	29
29	79	56	55.0	434,700	64			0	64
30	84	57	55.0	421,100	118	5		0	123

[1] Surface temperatures taken with pocket thermometer are given in degrees Fahrenheit.

TABLE 10.--Daily temperature, stream flow and fish count data, Rock Island Dam, July 1959

Date	Air temperatures Max.	Air temperatures Min.	Water temperatures[1]	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
July 1	89	60	56.0	406,100	120	10		0	130
2	79	62	56.0	396,800	55	10		0	65
3	-	-	56.0	371,200	125	3		0	128
4	76	58	56.0	365,900	38	17		0	55
5	76	63	57.0	364,200	112	19		0	131
6	70	60	56.0	353,800	117	101		0	218
7	73	58	56.0	347,000	91	107		0	198
8	76	57	56.0	343,600	94	176		0	270
9	88	58	56.5	331,800	108	187		3	298
10	93	50	57.0	323,600	93	149		0	242
11	97	68	59.0	309,900	96	179		0	275
12	92	69	60.0	297,300	205	350		0	555
13	-	-	59.0	291,600	233	441		0	674
14	91	62	59.0	298,600	249	821		0	1,070
15	92	65	59.0	297,300	149	708		0	857
16	93	66	59.5	285,800	214	680		0	894
17	95	68	59.5	289,600	180	879		2	1,061
18	-	-	60.0	283,900	140	1,216		1	1,357
19	103	68	60.0	283,900	93	1,406		1	1,500
20	98	68	60.0	289,600	178	2,270		0	2,448
21	96	73	60.0	276,600	195	3,303		4	3,502
22	104	72	60.5	276,600	190	3,077		3	3,270
23	85	68	60.0	263,900	109	1,971		2	2,082
24	90	65	60.0	265,700	121	1,934		2	2,057
25	85	73	61.0	265,700	121	1,824		2	1,947
26	95	66	61.0	255,600	132	2,237		6	2,375
27	80	62	61.0	255,500	180	2,483		6	2,669
28	78	53	61.0	245,700	334	4,081		6	4,421
29	84	56	60.5	242,600	225	3,583		11	3,819
30	92	60	60.5	230,000	102	1,793		4	1,899
31	97	62	61.5	228,500	107	2,143		6	2,256

[1] Surface temperatures taken with pocket thermometer are given in degrees Fahrenheit.

TABLE 11.--Daily temperature, stream flow and fish count data, Rock Island Dam, August 1959

Date	Air temperatures Max.	Air temperatures Min.	Water temperatures[1]	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
Aug. 1	-	-	62.5	212,600	226	1,485		12	1,723
2	95	68	62.5	207,200	328	1,718		14	2,060
3	83	64	62.5	204,500	627	2,909		23	3,559
4	79	60	63.0	180,400	788	2,808		29	3,625
5	-	-	62.5	178,000	430	1,874		23	2,327
6	-	-	62.5	162,200	125	1,241		2	1,368
7	-	-	62.5	159,000	108	853		13	974
8	94	59	63.0	159,000	218	763		41	1,022
9	92	58	63.0	156,900	234	1,070		26	1,330
10	87	66	63.0	152,800	940	1,347		42	2,329
11	-	-	62.5	143,000	785	1,904		50	2,739
12	-	-	63.0	140,000	361	1,125		40	1,526
13	84	58	62.5	136,000	197	1,029		9	1,235
14	84	62	62.5	131,900	318	1,205		36	1,559
15	-	-	62.5	125,000	300	807		56	1,163
16	-	-	63.5	125,000	339	752		64	1,155
17	-	-	63.5	125,800	458	884		73	1,415
18	-	-	63.0	115,800	473	969		91	1,533
19	-	-	63.0	111,700	317	1,143		88	1,548
20	-	-	62.0	107,900	88	709		51	848
21	87	51	61.5	101,900	114	567		81	762
22	80	62	62.0	99,100	126	704		57	887
23	86	68	63.0	96,300	87	372		78	537
24	78	72	62.0	98,400	82	491		44	617
25	-	-	62.5	95,600	110	445		93	648
26	-	-	62.5	106,300	134	522		141	797
27	-	-	62.5	98,400	57	451		124	632
28	-	-	62.5	96,300	121	279		81	481
29	86	42	62.0	99,100	53	232		82	367
30	84	42	62.5	97,000	108	180		62	350
31	84	48	62.0	97,700	117	236		74	427

[1] Surface temperatures taken with pocket thermometer are given in degrees Fahrenheit.

TABLE 12.--Daily temperature, stream flow and fish count data, Rock Island Dam, September 1959

Date	Air temperatures		Water temperatures[1]	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
Sept. 1	86	40	61.5	93,600	72	126	0	39	237
2	80	52	62.[illegible]	97,000	[illegible]	121	1	39	235
3	[illegible]	58	61.[illegible]	94,900	106	102	[illegible]	[illegible]	323
4	68	56	61.[illegible]	95,600	82	224	0	[illegible]	349
5	72	56	61.[illegible]	90,900	165	316	1	51	533
6	[illegible]	56	60.[illegible]	92,900	122	268	0	62	452
7	60	52	61.[illegible]	91,600	85	223	1	56	365
8	72	49	60.[illegible]	89,900	84	190	0	75	359
9	76	46	60.[illegible]	94,900	76	174	2	53	305
10	-	-	60.[illegible]	96,300	90	172	3	91	356
11	-	-	60.[illegible]	101,300	89	144	2	78	313
12	-	-	62.[illegible]	109,400	90	145	1	73	299
13	82	52	62.[illegible]	108,600	76	87	4	74	241
14	86	50	63.[illegible]	109,400	[illegible]	87	[illegible]	[illegible]	212
15	82	52	62.[illegible]	110,100	91	89	2	63	245
16	-	-	62.[illegible]	122,400	88	102	0	70	260
17	-	-	61.[illegible]	137,200	84	120	4	105	313
18	-	-	62.[illegible]	145,800	72	104	4	63	243
19	70	46	61.[illegible]	149,800	55	63	2	37	157
20[2]	68	44	61.0	146,800	17	9	3	18	47
21	72	50	61.[illegible]	144,800	37	70	3	29	139
22	72	48	61.[illegible]	140,800	39	32	9	30	110
23	72	50	60.[illegible]	138,100	48	21	11	31	111
24	-	-	62.0	131,000	171	28	11	100	330
25	-	-	62.[illegible]	121,600	87	16	8	110	221
26	-	-	62.[illegible]	126,700	41	16	5	62	124
27	70	48	61.0	127,900	98	8	2	106	174
28	-	-	61.0	128,400	62	11	11	80	164
29	67	47	61.0	132,200	68	8	10	102	188
30	-	-	60.0	131,900	30	6	4	82	131

[1] Ave. of morning and afternoon surface temp. taken with pocket thermometer and given in degrees Fahrenheit.
[2] Start of single shift counting.

TABLE 13.--Monthly totals of all anadromous fish counted at Rock Island Dam, 1959

Species	May	June	July	Aug.	Sept.	Total
Chinook	[illegible],165	1,819	4,091	7,193	1,121	17,392
Chinook (jacks)	656	1,157	1,415	1,576	1,156	5,960
Steelhead	352	0	59	1,700	2,027	,4,138
Sockeye (large)		5	33,391	27,904	2,668	63,968
Sockeye (small)			4,767	3,170	446	8,383
Coho					118	118
Total fish	[illegible],173	2,981	[illegible],423	[illegible],543	[illegible],536	99,959

TABLE 14.--Number and percent of steelhead counted over each fish ladder, Rock Island Dam, 1959

	Left ladder		Center ladder		Right ladder		Total
	Number	Percent	Number	Percent	Number	Percent	
May 1-15	20	15.7	75	59.1	32	25.2	127
May 16-31	83	36.9	47	20.9	95	42.2	225
June 1-15	-	-	-	-	-	-	-
June 16-30	-	-	-	-	-	-	-
July 1-15	3	100.0	-	-	-	-	3
July 16-31	41	73.2	8	14.3	7	12.5	56
Aug. 1-15	356	85.6	11	2.6	49	11.8	416
Aug. 16-31	971	75.6	48	3.8	265	20.6	1,284
Sept. 1-15	720	76.0	44	4.6	184	19.4	948
Sept. 16-30	763	70.7	148	13.7	168	15.6	1,079
Total	2,957	71.5	381	9.2	800	19.3	4,138

WEATHER AND RIVER DISCHARGE DATA

Headwater and tailwater elevations are plotted on figures 1 and 2 respectively. Water and air temperatures were taken twice daily by pocket thermometer. Daily records of weather conditions and stream flows are shown on tables 8-12. Daily river discharge data are plotted on figure 3.

ACTIVITIES AND OBSERVATIONS

Never before in the history of fish counting operations at Rock Island Dam have the first arrivals of chinook salmon been so late. First arrivals of this

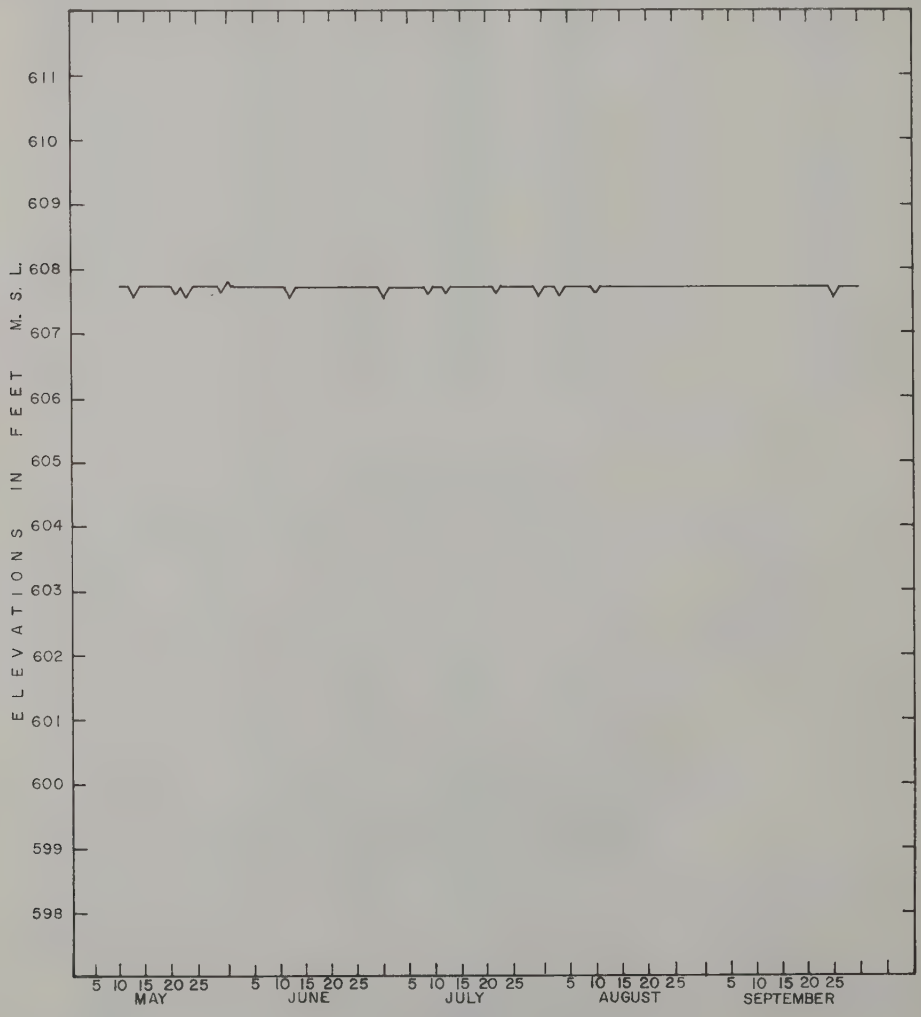

Figure 1.--Headwater elevations, Rock Island Dam, May 10-September 30, 1959

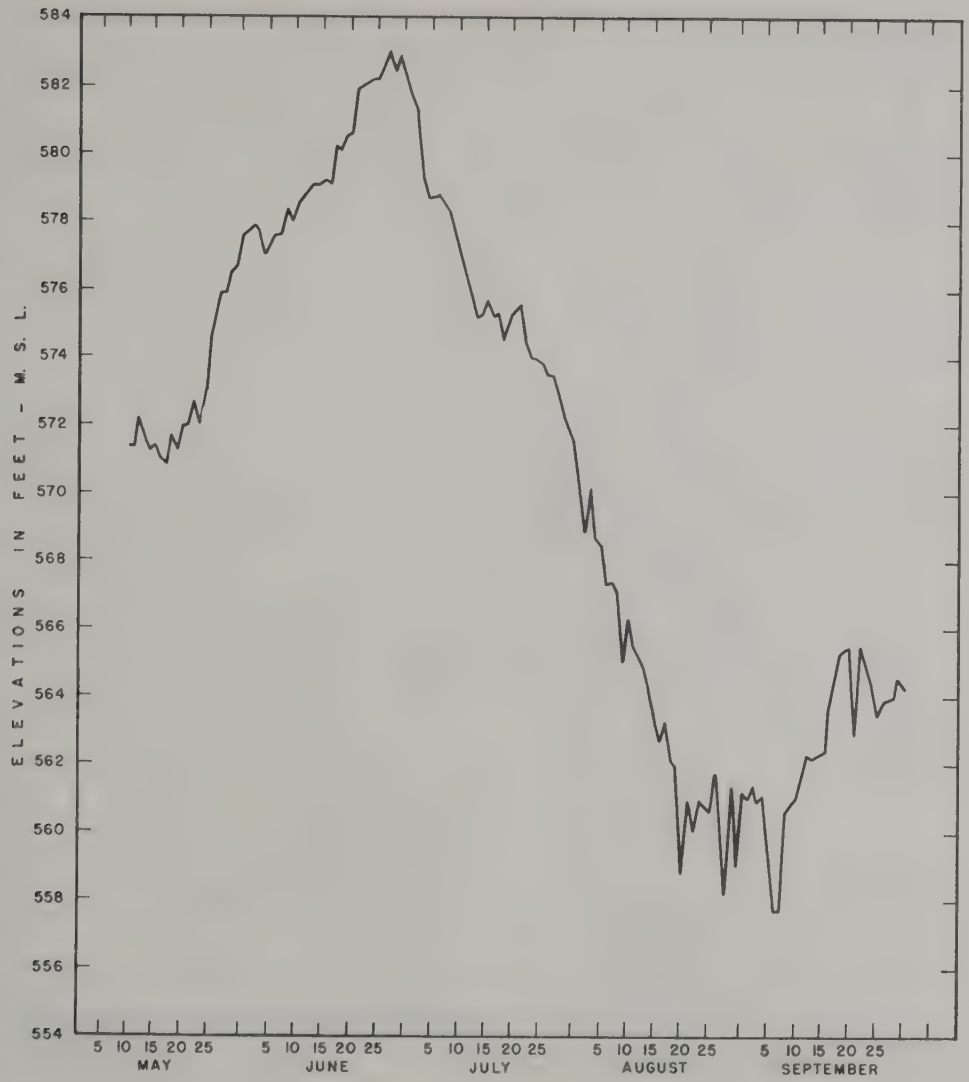

Figure 2.--Tailwater elevations, Rock Island Dam, May 10-September 30, 1959

year were recorded on May 18, approximately 17 days later than the average arrival date for the past 15 years.

General physical condition of salmon and steelhead passing over the Rock Island Dam fish facilities throughout the 1959 season appeared to be considerably below normal. Fish counters observed many fish bearing visible injuries about the head and sides. Injuries appeared to be more prevalent among large chinook and blueback.

Upstream migration of blueback salmon during 1959 showed a peculiar deviation from the normal. Usually,

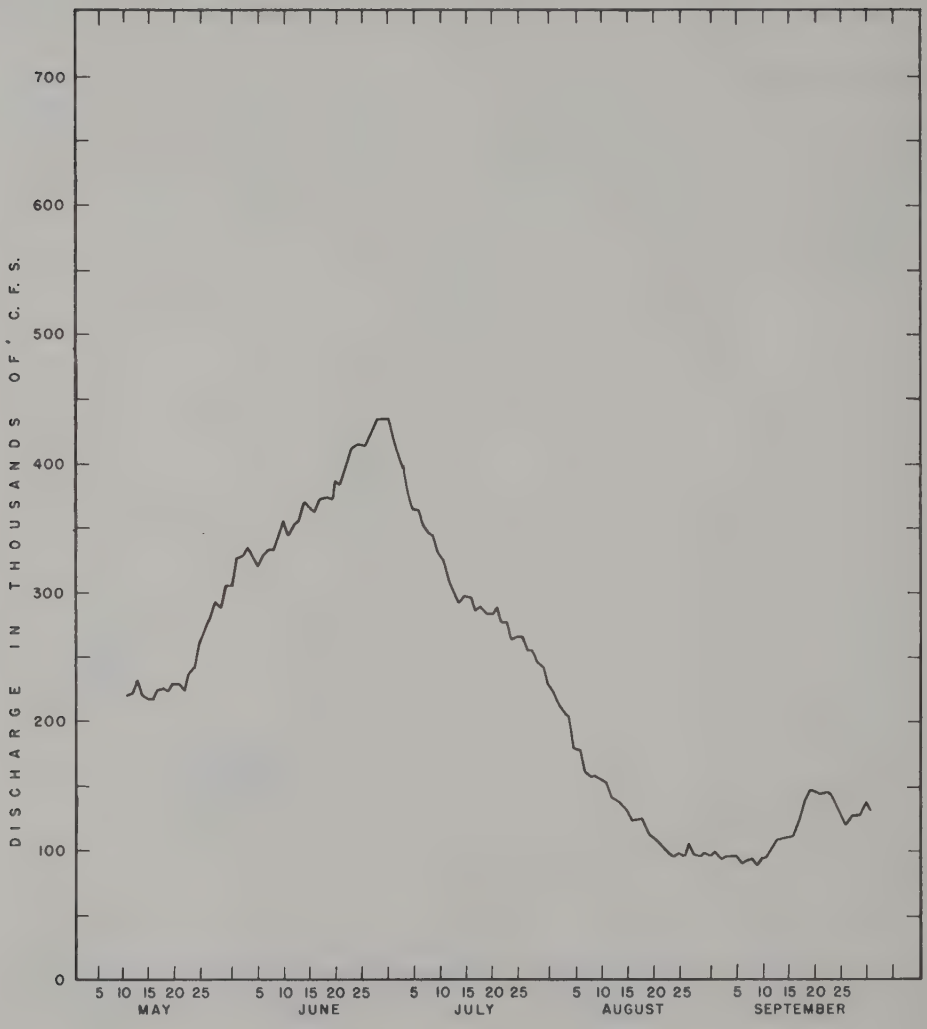

Figure 3.--Daily river discharge, Rock Island Dam, May 10-September 30, 1959

decline in the run after peaking is very rapid until the count is just a few fish per day. Decline from the peak in 1959 was comparatively rapid until the number of fish was approximately 100 to 300 per day. Counts continued at this level for an unusually long period of time and many very red (near ripe) fish were observed.

The cooling-water screens at Rock Island Dam were a hazard to downstream migrant salmon in previous years. Several hundred dead migrants were taken from these screens in a 24-hour period. Hoods have now been installed which cover the cooling-water intakes and prevent migrants from entering. As a result of installation of

these hoods, migrant mortality has been nearly eliminated.[3] Observations made prior to installation of the protective hoods indicated some of the migrants emerging from the draft tubes into the tailwater were stunned and became easy prey for predators and gulls.

In 1959, trapping of fish from the left bank fish ladder was conducted for the following experiments:

1. Collection of *Chondrococcus columnaris* cultures by Washington School of Fisheries--July 17, from 10:20 a.m. to 1:45 p.m.; July 24, from 7:10 a.m. to 9:45 a.m.; and August 7, from 8:00 a.m. to 10:45 a.m.

2. Effect of light on maturation studies by Bureau of Sport Fisheries and Wildlife, National Fish Hatchery, Entiat, Wash.--July 23, from 6:30 a.m. to 2:20 p.m.

3. Fecundity studies by Bureau of Commercial Fisheries Biological Laboratory, Seattle, Wash.--July 23, in conjunction with trapping blueback for Entiat Hatchery.

The four times that it was necessary to dewater the fish ladder during 1959 are as follows:

1. Middle fish ladder, from 10:00 a.m. January 12, 1959, to 1:30 p.m. January 13, 1959, to repair broken links on telescopic gate chains.

2. Middle fish ladder, from 8:00 a.m. to 4:00 p.m. November 23, 1959, for inspection and cleaning.

3. Right bank fish ladder, from 8:00 a.m. to 4:00 p.m. November 25, 1959, for inspection and cleaning.

4. Left ladder, from 8:00 a.m. to 4:00 p.m. November 24, 1959, for inspection and cleaning.

Some slight variation in the spillway gate opening sequence was necessary during the season due to damaged guide rails in the gate slots. This variation was not of sufficient consequence to cause adverse effects on the fish runs.

During the year the Bureau of Commercial Fisheries installed experimental electronic fish counting tunnels in left bank fishway at Rock Island Dam. The studies were conducted in such fashion as to not interfere with regular counting operations.

SUMMARY

1. The total Rock Island Dam count of salmon and steelhead in 1959 was 99,959 which was less than the 1958 count of 135,182.

2. Yearly total counts of fish passing Rock Island Dam during the period 1933-1959, inclusive, are given in table 1.

3. The chinook salmon count of 23,352 in 1959 was less than in 1958 and less than half the peak year of 1957. In 1959, 5,960 jacks were recorded, representing 25.5 percent of that year's count.

4. The sockeye count of 72,351 in 1959 was less than in 1958 but exceeded the 26-year mean of 52,073. A

[3] Biological Report, Rocky Reach Fisheries Research Program, 1958, Washington Department of Fisheries (Unpublished).

Rock Island Project. Alleviation of Mortality to Downstream Migrant Salmonids on Cooling Water Screens, February 23, 1960, Chelan County Public Utility District. (Unpublished).

greater percentage of sockeye utilized the left bank ladder than used either the middle or right bank ladders. In 1959 small sockeye under 16 inches in length comprised 11.6 percent of the count.

5. Very few coho salmon have appeared at Rock Island Dam in the period 1933-1959. The greatest count, 229, occurred in 1947. The 1959 count was 118.

6. The steelhead count of 4,138 in 1959 exceeded the 26-year mean of 2,900.

7. Although no quantitative data are available it was the general impression of the fishway superintendent that more injured fish were observed in 1959 than in any previous year of counting. This was especially true of chinook and blueback.

8. Mortalities of downstream migrants have occurred in the cooling water facilities at Rock Island Dam. In 1958, modifications were made of these facilities, and observations in 1959 indicated that mortalities had decreased.

9. Fish counting was begun on May 4 and terminated September 30. Sample counting was conducted from May 4 through July 15.

10. In 1959 the maximum number of salmonids counted in one day (4,412) was on July 28.

11. Trapping facilities in the left bank fishway were used on several occasions to collect adult fish for experimental purposes.

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